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A new species of *Hyphodiscus* (*Helotiales*) on *Stereum*

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Abstract — A new species, *Hyphodiscus stereicola*, is described based on material from Northern Europe, the Canary Islands, and North America. In all of these, greenish apothecia grew on decayed basidiomata of *Stereum* spp. Morphology and host specialisation of the new species are compared with those of other members of the genus.

Key words — fungicolous ascomycetes, rDNA, taxonomy

Introduction

Hyphodiscus is a genus in the order *Helotiales* characterised by hairy apothecia that are formed on dead, often decorticated, deciduous or coniferous wood. Several species occur on decaying fruitbodies of polypores and corticioid fungi.

Several years ago a light glaucous fungus was found on old basidiomata of *Stereum* in Mexico. The material was sent for identification to the late Ain Raitviir (Tartu, Estonia), who made some hand-written remarks about the delimitation of this fungicolous species as a member of the genus *Hyphodiscus*. Soon a similar specimen was collected in Northern Europe, from Estonia. In autumn 2008, additional material was found from La Gomera (Canary Islands) and Estonia. All four collections are similar in their morphology and host. As these represent a unique combination of characters in the genus *Hyphodiscus*, a new species will be described herein.

Materials & methods

Living ascomata were studied in tap water, 3% aqueous KOH solution, Melzer's reagent (MLZ) and Lugol's solution (LUG). Microphotos and measurements of microscopical elements were taken from living cells of unsquashed freehand sections under cover

glasses. The colour names and codes were adopted from Kornerup & Wanscher (1967). DNA was extracted and the ribosomal DNA ITS regions and 5' end of the large subunit amplified and sequenced according to the protocol described by Põldmaa (2011). The primers ITS1F and LR5 were used for PCR and sequencing. The holotype of the new species is deposited in the mycological herbarium of the Natural History Museum of the University of Tartu (TU). The DNA sequences were deposited to EMBL and the UNITE database (Kõljalg et al. 2005).

Taxonomy

Hyphodiscus stereicola Raitv., Pärtel & K. Põldmaa, **sp. nov.** PLATE 1

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Apothecia gregaria, subsessilia, cupulata, 300–600 µm diametro, margine piloso, viridi-albo, disco olivaceo. Pili cylidracei, obtusi, incrustati, septati, 31–62 × 2–2.8 µm. Excipulum ectale gelatinosum, cellulis venetis; medulla textura intricata composita, brunneolo-aurantiaca. Asci cylindraceo-clavati, octospori, 37–47 × 5–6 µm longi, basi uncinati, poris in solutione iodi non coloratis. Ascosporae hyalinae, ellipsoideae, apicibus obtusis, biguttulatae, 7.6–11.5 × 2.6–4 µm. Paraphyses filiformes, 1.5–2 µm in diametro. Fungicolae ad basidiomata Stereumorum.

HOLOTYPE — **ESTONIA**. **JÕGEVA CO.**, Puurmani Community, Alam-Pedja Nature Reserve, ca 50 m SW from the beginning of the Kirna hiking trail, mixed forest with dominant *Populus tremula*, 58.544°N, 26.233°E, on decaying basidiomata of *Stereum subtomentosum* Pouzar, 8 Oct 2008, leg. Kadri Põldmaa, TU 104241 [EMBL FN995636].

ETYMOLOGY — named after the host genus.

ECOLOGY — fungicolous, growing on old basidiomata of *Stereum* spp.

APOTHECIA densely gregarious, subsessile to shortly stipitate. Disc almost flat to slightly depressed, 300–600 µm in diameter, olivaceous (1E5). RECEPTACLE at first deeply cup-shaped, later saucer-shaped, externally and at the margin with numerous greenish-white (25A2–3) hairs. Ectal excipulum composed of gelatinous, more or less parallel, slightly interwoven, bluish-green (25B7) pigmented cells terminating above the surface into cylindrical hairs (10–19 × 2–2.2 µm). Medullary excipulum brownish-orange (5C6), of textura intricata. HAIRS greyish green (30C3), mostly straight, cylindrical, slightly pointed, thin-walled, 0–3-septate, 31–62 × 2–2.8 µm, without iodine reaction; wall (except the base) covered with loose irregular-tuberculate greyish green warts. Pigment in excipulum and hair walls dissolving in KOH, apothecia extracting pale yellow hue into KOH solution. ASCI arising from croziers, 8-spored, cylindric–clavate, conically pointed at apex, apical pore not staining in Lugol's or Melzer's reagent (with or without KOH pretreatment), 37–47 × 5–6 µm. ASCOSPORES ellipsoid with obtuse apices, hyaline, smooth, biguttulate (one lipid body at each end, 1–2.8 µm in diameter), aseptate, biseriate or irregularly seriate in asci, 7.6–11.5 × 2.6–4 µm. PARAPHYSES filiform, with 2–3 septa, not exceeding the asci, approximately as long as the asci, 1.5–2 µm in diameter, filled with fine green

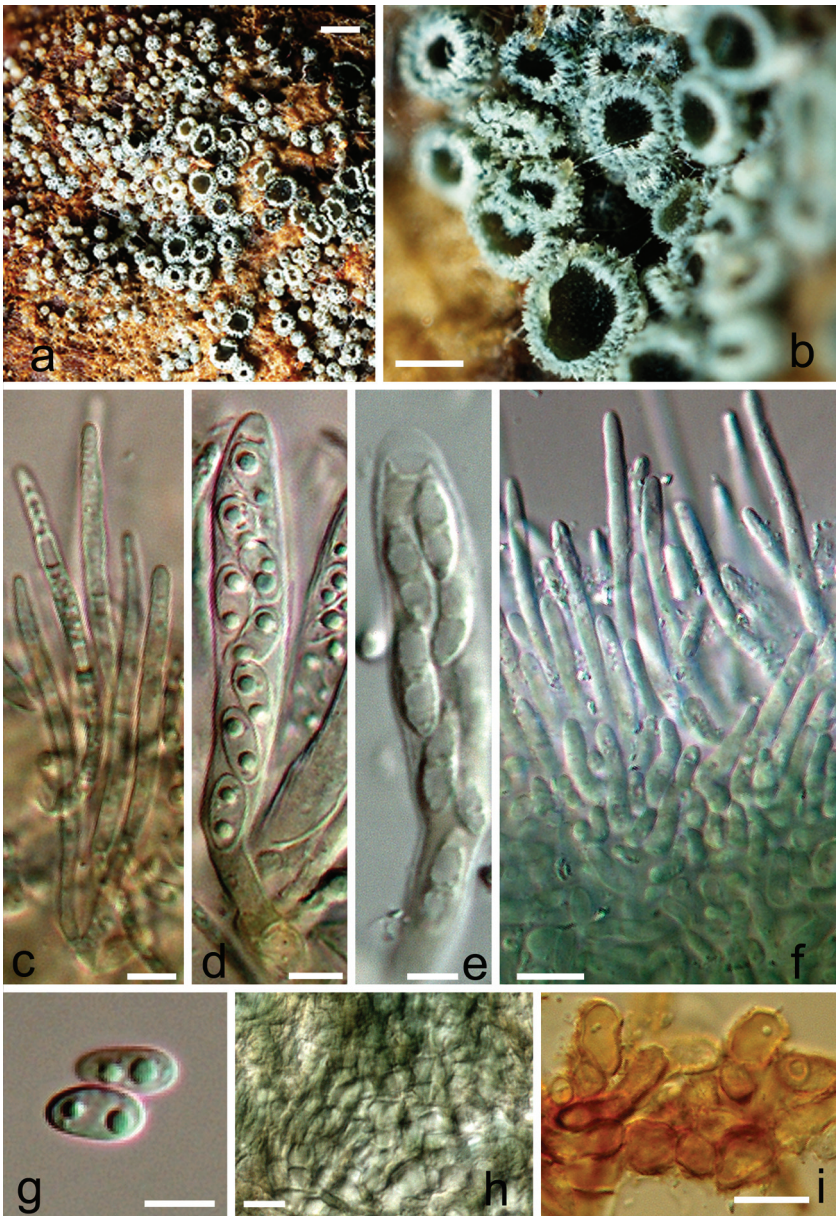

Plate 1. *Hyphodiscus stereicola.* a, b. apothecia; c. paraphyses; d. asci; e. asci (in Melzer's); f. Hairs and upper part of excipulum; g. ascospores; h. ectal excipulum; i. medullary excipulum; (a-d, f, g, i = holotype); e, h = TU 104272. All microscopical subjects (except e) were mounted in water. Scale bars: a = 500 µm; b = 300 µm; c–e, g = 5 µm; f, h, i = 10 µm.

vacuolar bodies, simple or branched only at the base, gradually sligthly tapering towards the apex.

Additional specimens examined: **ESTONIA**. **Pärnu Co.**, Saarde Community, W of Reinu, Nigula Nature Reserve, *Picea abies* nemoral forest, 58.04183°N, 24.72383°E, on dead basidiomata of *Stereum subtomentosum*, 26 Aug 2003, leg. I. Parmasto, TAAM 181316. **MEXICO. Chihuahua**, Sierra Madre Occidental, Cascada de Basaseachi, above the left riverbank at the bottom of the waterfall, 28.16944°N, 108.20694°W, alt. ca 1650 m, in mixed forest, on dead basidiomata of *Stereum ostrea* (Blume & T. Nees) Fr., 24 Jul 1994, leg. J. Hafellner 38772, TAAM 200599. **SPAIN**. **Canary Islands**. La Gomera, Garajonay National Park, near El Cedro, in laurel forest, 28.13090°N, 17.21319°W, alt ca 800 m, on dead basidiomata of *Stereum ostrea*, 2 Dec 2008, leg. K. Põldmaa; TU 107690 [EMBL FR686966]; leg. K. Pärtel, TU 104272.

Comments. *Hyphodiscus stereicola* clearly differs from other species in the genus due to a unique combination of characters: olivaceous disc, greyish green hairs, and the comparatively large ellipsoidal ascospores. Characteristic of the species is also its fungicolous habit and specialization to old basidiomata of *Stereum*.

It is similar to *H. viridipilosus* (Graddon) Baral which also has green hairs and ellipsoidal ascospores. This species, growing on deciduous wood, is characterized by an ochraceus apothecial disc (Graddon 1974, Baral 1993). The asci and ascospores are smaller (ca 3–4 × 1.5–2 µm) than in *H. stereicola*. There are several yet undescribed species shown in Hans Otto Baral's detailed drawings (Baral & Marson 2005), none of which seems to resemble *H. stereicola*.

Hyphodiscus stereicola reveals substrate specificity, as all the specimens have been collected on *Stereum* spp. Found either on the pileus or on the hymenium, it appears to prefer decaying basidiomata. In the two collections from boreal forests in Estonia the host is *S. subtomentosum*. The morphologically very similar species, *S. ostrea* having a southern distribution, serves as the host for the other specimens, collected in Mexico and the Canary Islands. In Estonia and La Gomera the collection habitats represent primeval forests with many fallen rotting trunks.

Although the fungicolous lifestyle is rare among the *Helotiales*, members of *Hyphodiscus* tend to grow on fruitbodies of basidiomycetes. The most common of these, *H. hymeniophilus* (P. Karst.) Baral, grows on decaying basidiomata of *Antrodia serialis* (Fr.) Donk, *Antrodiella hoehnelii* (Bres.) Niemelä, *Piptoporus betulinus* (Bull.) P. Karst., *Polyporus varius* (Pers.) Fr. and *Trametes versicolor* (L.) Lloyd (Helfer 1991). *Clavidisculum stereicola* (Cooke) Raitv., later synonymised with *H. hymeniophilus* by Raitviir (2004), was reported to grow on *Stereum* sp. (Raitviir 1970).

In addition, *H. theiodeus* (Cooke & Ellis) W.Y. Zhuang occurs on *Peniophora* spp. (Zhuang 1988) and other wood-decaying basidiomycetes, while *H. incrustatus* (Ellis) Raitv. has been found on old *Polyporus* spp. (Raitviir

2004). Hosoya et al. (2010) speculated that fungicolous association might stimulate formation of ascomata in the whole genus, as suggested by the frequent observation of other fungi near *Hyphodiscus* fruitbodies.

Hyphodiscus stereicola is one of the few species of apothecial ascomycetes that is found on basidiomata of species of *Stereum*. At the same time members of this basidiomycete genus serve as hosts to a number of representatives of the *Hypocreales*, the ascomycete order richest in fungicolous associations. Besides several species of *Hypomyces* (Põldmaa 2003, Rogerson & Samuels 1993) and *Sphaerostilbella*, these include also *Nectriopsis oropensoides* (Rehm) Samuels. Despite the overall low host-specificity of members of these fungicolous genera growing on aphyllophoroid basidiomycetes (Põldmaa 2000, Rogerson & Samuels 1993), the majority of the species inhabiting *Stereum* are found only on basidiomata of this genus. The annual, dimitic, comparatively soft basidiomata apparently provide a specific niche, in contrast to the mostly perennial, di- or trimitic, tough basidiomata of many aphyllophoroid genera which host other fungicolous ascomycetes, including *Hyphodiscus*. Such specialisation could also be explained by the phylogenetic component as the genus *Stereum* (*Russulales*) is not closely related to most of the other aphyllophoroid genera distributed across the *Agaricomycetes*.

The asexual stages of *Hyphodiscus* species have been described in the anamorph genus *Catenulifera*: *C. rhodogena* (F. Mangenot) Hosoya for *H. hymeniophilus* and unnamed *Catenulifera* spp. for *H. pinastri* R. Galán & Raitv., *H. theiodeus,* and *H. otanii* Hosoya (Galán & Raitviir 2004, Hosoya 2002). Our attempts to isolate the most recent collections into pure culture were not successful.

The genus *Hyphodiscus* has been accepted as a member of *Hyaloscyphaceae* by most authors (Verkley 1993, 1996; Hosoya 2002; Raitviir 2004, Hosoya et al. 2010) with unclear affinities based on rDNA sequences (Untereiner et al. 2006, Bogale et al. 2010). However, rDNA ITS and SSU sequences reveal that *H. hymeniophilus* is related to members of *Hyaloscyphaceae* and *Dermateaceae* but also to anamorphic helotialean root endophytes like *Phialocephala (Vibrisseaceae)* (Untereiner et al. 2006, Bogale et al. 2010). The true phylogenetic relationships of *Hyphodiscus* species are currently being clarified (R. Galán pers. comm.). The rDNA ITS region of the two Estonian specimens of *H. stereicola* were identical, whereas that of the La Gomeran material differed in 6 bp. A BLAST search of ITS regions found only weak correspondence between the type of *H. stereicola* and databased sequences from identified species (a best match of 84% with *H. hymeniophilus* and *Catenulifera brachyconia* (W. Gams) Bogale & Unter.). However, the true phylogenetic affinities of *H. stereicola* remain unclear due to the lack of sequence data for most of the species of this and related genera.

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